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ABSTRACT

This book introduces journal-writing prompts in mathematics for grades 7-8. Content prompts, attitudinal or affective prompts, and process prompts are presented. Each of the content prompts relates or connects topics within and outside of mathematics, targeting important or meaningful concepts and skills. The content prompts also provide situations that focus on areas in which students often have misunderstandings or misconceptions. Attitudinal or affective prompts focus on students' feelings about themselves as mathematicians and students of mathematics. The responses to the process prompts can give insight into students' preferences for problem-solving strategies and how they learn or remember. (KHR)

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The "Write" Way

Mathematics Journal Prompts

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FOR GRADES 7–8

Barbara J. Dougherty

A Publication of the University of Hawai'i's Curriculum Research & Development Group

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The "Write" Way

Mathematics Journal Prompts

FOR GRADES 7–8

Barbara J. Dougherty

A Publication of the University of Hawai'i's
Curriculum Research & Development Group

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Contents

Introduction 3

Content Prompts 7

I. Number and Operations 7

II. Algebra 13

III. Measurement 17

IV. Geometry 19

V. Statistics and Probability 23

Affective/Attitudinal Prompts 25

Process Prompts 28

Using Writing in Your Classes

1. Share with students the rubric you are using.

2. Make copies of the rubric for students to keep in their notebooks and post one copy in the classroom.

3. Give students a practice prompt to write about. Allow about six minutes for them to respond. The practice prompt is usually an affective/attitudinal one. Regardless of the type you select, it should be one that all students can attempt.

4. Have students compare what they wrote with samples of other students' work that you provide. Or ask them to compare work with their partner or table mate.

5. Compare their work with the rubric. Have students focus on three things they could do to move their writing up a level. If their writing is already at the top level, ask them to write another question that this prompt made them think of.

6. Allow three minutes for students to correct or revise their work. (They should strive to reach the two top levels.)

7. Collect the work.

8. For the first writing prompt to be done outside of class, assign a prompt that you think *all* students can write about.

9. When students return to class with their assignment, have them compare their writing with the rubric.

10. Allow two minutes for students to correct or revise their work. (They should strive to reach the two top levels.)

11. Repeat this phase as often as needed to help students understand your expectations for their writing.

The "Write" Way: Mathematics Journal Prompts for Grades 7–8

The *Principles and Standards for School Mathematics* (National Council of Teachers of Mathematics, 2000) includes a separate standard for Communication for grades 6 through 8. This standard advocates using multiple activities that give students opportunities to demonstrate their understandings. These tasks should allow students to express themselves in a variety of ways such as with concrete models, pictures or drawings, or abstract symbols. Each of these forms lets students communicate with others about their thinking.

Communication should include at least five types of activities: (1) speaking, (2) reading, (3) listening, (4) modeling or constructing, and (5) writing. The last type can take the form of journal writing.

Journal writing can be structured to give you cohesive and comparable information about students and their thinking while you are challenging them through contextual situations. A structure for journal writing includes (1) mathematical content, (2) students' attitude or affect, and (3) processes.

Journal prompts give situations or questions to which students respond. Responses may include words, pictures or drawings, or symbols. Students should be encouraged to support their ideas or to clearly explain what they mean. They can give specific examples as part of their explanations.

Content prompts relate or connect topics within and outside of mathematics, targeting important or meaningful concepts and skills. They can also provide situations that focus on areas where students often have misunderstandings or misconceptions. The responses to the prompts give teachers (and students) insight into how a student has interpreted a mathematical idea.

Attitudinal or affective prompts focus on students' feelings about themselves as mathematicians and students of mathematics. Students' responses allow you to assess how positive attitudes about mathematics and mathematicians are developing in the classroom environment.

Finally, being aware of how one solves or approaches problems is promoted by **process prompts.** The responses to these prompts can give insight into students' preferences for problem-solving strategies and into how they learn or remember. As students become aware of how they learn and solve problems, they grow stronger in confidence.

Introduction: Grades 7–8

Description of materials

There are at least 100 prompts to choose from. Some of them may be used more than once to ascertain how students are growing in their understandings of and beliefs about mathematics. The prompts may also be used as assessment tasks for expanded response or self-constructed response items.

Each mathematical content prompt includes a short description of what you might expect or consider in students' responses. The mathematical content responses should reflect a student's progress in understanding the concept or skill.

The content prompts were selected to match recommendations from the National Council of Teachers of Mathematics (*Principles and Standards for School Mathematics*, 2000) rather than to fit a specific text. Locate the topic that you are studying and then select the prompt that best fits the class. You may change the wording if students will not understand the terminology or vocabulary used.

Affective or attitudinal prompt responses show students' beliefs. If you use them more than once, you should be able to detect changes in beliefs or feelings about mathematics as a discipline as the year or semester progresses.

Process prompts give students an opportunity to show how they do a mathematical process or algorithm (step-by-step procedure). When you use these prompts, you gain insight into how students have interpreted or altered procedures.

You can use writing prompts daily or intermittently, depending on your class, and you can repeat them from time to time. In prompts that use students' names, feel free to change the names to represent your students. If journal prompts are given daily, we recommend that students respond to three content prompts, one process prompt, and one attitude prompt in a week.

Evaluating students' responses

When we tested journal writing in classes, we found that students tend to give the writing more thought if it is to be scored. One method our writing team used was to score the responses on content rather than on grammar and spelling. We used an essay grading method, reading two or three papers to get a feel for students' responses. These first papers formed the baseline for scoring other papers.

We designed this rubric for scoring journal responses.

4 points: The student's work includes—

- a completed prompt or an answer to the question posed.
- support for statements made by using either examples or counterexamples.
- ideas clearly communicated to the reader.
- legible writing, drawings, pictures, charts or tables, and diagrams.
- accurate mathematics or information.

3 points: Omission of one criterion from level 4.

2 points: Omission of two criteria from level 4.

1 point: Omission of three criteria from level 4.

0 points: Omission of more than three criteria from level 4.

There are many ways to create a rubric. Teachers alone can develop a rubric, or students can work with the teacher to develop a rubric specific to their class. Here are two sample rubrics that have been developed with students' participation.

A five-level scale:

4 **The student's work shows a response that—**
- addresses the question raised in the prompt.
- has correct or accurate mathematics.
- is legible.
- has support or justification for any statements made.
- makes sense to the reader.

3 **The student's work shows a response that—**
- addresses the question raised in the prompt.
- has correct or accurate mathematics.
- is legible.
- does not have fully justified or supported statements.
- makes sense to the reader.

2 **The student's work shows a response that—**
- addresses the question raised in the prompt.
- has some incorrect or inaccurate mathematics.
- is legible.
- does not have justified or supported statements.
- is somewhat clear to the reader.

1 **The student's work shows a response that—**
- addresses the question raised in the prompt.
- has incorrect or inaccurate mathematics.
- is partially legible.
- does not have justified or supported statements.
- does not make sense to the reader.

0 **The student's work shows a response that—**
- does not address the question raised in the prompt.
- has incorrect or inaccurate mathematics.
- is not legible.
- does not make sense to the reader.

A three-point scale:

Exceeds standard The student's work shows a response that—
- addresses the question raised in the prompt.
- has correct or accurate mathematics.
- is legible.
- has support or justification for any statements made.
- makes sense to the reader.

Meets standard The student's work shows a response that—
- addresses the question raised in the prompt.
- has some correct or accurate mathematics.
- is legible.
- does not support or justify some of the statements made.
- makes sense to the reader.

Below standard The student's work shows a response that—
- does not address the question raised in the prompt.
- has incorrect or inaccurate mathematics.
- is not legible.
- does not support or justify statements made.

Although grammar and punctuation are not usually scored, students should communicate their ideas in ways that are understandable. Some students may use drawings, tables, charts, or other means to convey their ideas. Encourage them to use whatever way they need to make their ideas clear.

After the first writing assignment, you can take excerpts from students' papers to illustrate qualities that you consider important. Show comparisons between high- and low-quality responses by putting them on overhead transparencies or photocopying them for all students. Keep the responses anonymous.

Content Prompts: Grades 7–8

You can present the prompt to the whole class and have students share ideas. You can record their ideas on big chart paper or on the board. The chart paper provides a permanent record that can be revisited later in the year to check the progress of students' understanding of or thinking about mathematical concepts or skills. At that time, you can revise students' comments or add new add ideas.

You can also use the prompts in a problem-solving context where students create a solution in a group or individually. If groups work on the problems, they can share their ideas before the whole class. If they work individually, you will need to find some way to provide for a sharing of ideas. Either way, their ideas should be recorded for future reference.

I. Number and Operations

1. **Sharona wrote, "$\frac{2}{5} + \frac{3}{7} = \frac{5}{12}$." Use an estimation strategy to show that her solution is either correct or incorrect. Be specific in your description of how you used your estimation strategy.**

   Students may use estimation with benchmarks of 0, $\frac{1}{2}$, and 1. Other techniques may be used, but students should describe the process or the strategy carefully.

2. **Molly said, "Fractions were difficult. Decimals and percents should be easier." "But aren't fractions, decimals and percents related?" asked Bart. What would you tell Molly and Bart? Give specific examples to support your response.**

   Students' responses may indicate that they are all rational numbers. Or they may suggest that each of these number types can represent part-whole relationships. Models for fractions can be applied to percents or decimals.

3. **"I asked Carenna how much pizza she had. She said she had half a pizza. But when I asked the teacher how many students were gone today, she said half!" exclaimed Minna. "How can she use *half* to describe both things?" What would you tell Minna? Use specific examples.**

   Students should compare the context of fractions. That is, the number $\frac{1}{2}$ can be used to describe situations in which there is a ratio of one to two. Even though the number is the same, the actual amount is relative or proportional to the whole.

4. **Draw a picture that represents 50%. Explain how your drawing shows 50%.**

   Students should include some notion of a whole compared to a part. Some responses may indicate that the size of 50% depends on the size of the whole or that 50% is equivalent to $\frac{1}{2}$ or 0.5.

5. **Jered and Pat were arguing about what a rational number is. Describe, using examples, what you think it is.**

   Answers will vary. Depending on your class discussion, students should include whole numbers, fractions, percents, decimals, and integers.

6. **Kasha said, "I make fractions have a common denominator when I multiply, add, subtract, and divide." "I only make fractions have common denominators when I add and subtract," said Kevin. Who do you agree with? Why?**

   Students should note that either of the two students could be correct. It does not depend on the computational algorithms as the algorithms work regardless of which one students select.

7. **My favorite fraction is _____. Write a word problem with this fraction as part of the problem. Solve the problem.**

   Answers will vary. You may have students exchange their problems and solve.

8. **Write a short story that uses fractions.**

   These stories would make an excellent connection with a language arts activity. They could be shared within a group, and the group could select one to share with the class. Or they could be displayed on a bulletin board. If you want a seasonal flavor, indicate that you want a Thanksgiving, Christmas, or other season context for the story.

9. **Write a word problem that can be solved by dividing two fractions. Show the solution.**

   Students should write a problem solved by dividing. Be sure to check that division is the appropriate operation.

10. **Darron's calculator is broken. It doesn't always put the decimal point in the right place. So he has difficulty deciding if an answer is correct. He multiplied 43.7892 × 2.01605. His calculator showed a product of 8.8281216. Do you agree? Why or why not?**

    Disagree because an estimate of the product is closer to 88. Some students may show you how to solve the problem with the multiplication algorithm. Expect more justification than merely counting the decimal places.

11. **Write a word problem that uses percents and can be solved by the number sentence 0.25 × ____ = 140.10.**

Answers will vary. Be sure to check the problem to determine if multiplication is the correct operation.

12. Describe a situation in which you would use decimals. Why would decimals be used?

Answers will vary. Students should represent an appropriate situation for decimals.

13. An exponent of 3 means . . .

Students should indicate that 3 designates the number of times the base is used as a factor.

14. Scientific notation is (is not) needed because . . .

Students usually indicate that it is needed to describe very large or very small numbers. Some may relate it to calculator use or give science examples.

15. Erica said, "-2^4 is -16." Eric argued, "No, -2^4 is 16." Who do you agree with? Why?

Students should agree with Erica and support their answer. When there are no parentheses, the number is raised to the designated power first. Then the opposite of that number is found.

16. Marty dropped spaghetti sauce on his math paper. What do you think is under the sauce he dropped? Why?

14 + [redacted] =

This problem cannot be solved because it is undefined.

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Students should indicate that division by 0 is undefined and give a rationale as to why it is undefined. That is the only possible number that Marty could be using in his division problem. All other real numbers are defined for division.

17. Tina found a prime number larger than 37 but smaller than 61. What number do you think she found? Prove that it is prime.

Students may select from 41, 43, 47, 53, or 59. They should provide a discussion about the factors of their number or some other justification that is related to prime numbers.

18. A prime number is (or is not) like a composite number because . . .

Answers will vary. Students' responses may focus on the number of factors the numbers have. Or they may include definitions of prime and composite numbers. Do not accept only definitions. Students should link the definitions to the journal prompt.

19. Lehua said, "There are many prime numbers. And I know if we keep looking for prime numbers, we can find one that is even and larger than 111." Jonathan replied, "That can never be possible." Who do you agree with? Justify your choice.

Any even number after 2 has at least 2 as a factor. Therefore those numbers cannot be prime. Agree with Jonathan.

20. Sasha said, "One is the smallest prime number." Jeri said, "No, two is the smallest prime number." Who do you agree with? Justify your choice.

One has only one factor, itself. Therefore it is not a prime number. Two is the smallest prime number.

21. Jason said, "All numbers have an even number of factors." "No, they don't," said Brad. "Some special numbers have an odd number of factors." Why would Brad say that? What was he talking about?

Students should note that square numbers have an even number of factors.

22. I used to think a factor was . . . Now I know that a factor is . . .

Answers will vary. Students' responses will give you an indication of what they believe a factor is.

23. Tanya rounded a fraction to $\frac{1}{2}$. What fraction(s) could she have rounded? Why?

Students may comment on the relations of the numerators and denominators in estimating fractions. They may list many fractions, including but not limited to $\frac{3}{5}, \frac{4}{9}, \frac{3}{6}, \frac{11}{20}, \frac{2}{5} \ldots$

24. Front-end estimation is a useful strategy. How do you use it with decimals or whole numbers?

Students usually describe the truncation process based on a particular place value. They may also comment on adjusting the first estimate by looking at the size of the number they truncated.

25. How do you decide when to use an estimate and when to find an exact answer?

Answers will vary. Students' descriptions should appropriately address the contexts of using either an estimate or an exact answer.

II. Algebra

1. **8, 4, 0, –4, –8, . . .**

   Find three different ways to describe the number pattern. Create another pattern that could be described in at least three ways.

   One way to describe the pattern is to indicate that four is subtracted from the previous term. A second way is to skip-count backward by four. The third way may be to indicate that the pattern will continue with 8, 4, 0, –4, –8 repeating. If the pattern can be verified, you should accept it.

2. $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}, \frac{1}{32}, \frac{1}{64}, \ldots$

   This pattern will (or will not) end because . . .

   The pattern is infinite. The denominator is increasing by a power of two. Even though the fractions are getting close to zero as the denominator increases, the pattern can continue to infinitely large denominators.

3. **Carrie asked the teacher, "I have a function that takes a number and increases it by 2. When I graph it, I get a line that goes up from left to right. Does every function have a graph that goes up from left to right?" What do you think the teacher said?**

   Students should indicate that a function's graph does not always have a positive slope. It is possible for the line to have a slope of 0 or a negative slope. But a function cannot have an undefined slope.

4. **A function is the same as (or different from) a relation because . . .**

   A function is a relation, but not all relations are functions.

5. **Adding or subtracting integers is (or is not) like adding or subtracting whole numbers because . . .**

   Answers will vary. Students may describe a similarity related to the inclusion of whole numbers in the set of integers.

6. **When I add two integers, I can tell when the sign of the sum will be negative if . . . Support your response with examples.**

   Many students will mention that the addend with the largest absolute value determines the sum's sign.

7. **4(25 + 17) = ?**

   Karina found at least two ways to solve this problem. What do you think they were? Justify the methods.

   Some students may mention the distributive property as well as adding in the parentheses before multiplying.

8. **An expression and an equation are alike or different because . . .**

   An expression is not equal to anything. In an algebraic expression, the variable can assume different values. Hence you cannot solve an expression for a specific variable value.

9. **When I solve computation problems, I use the property of_____ most often because . . .**

   Answers will vary. Students' responses give you an indication of real number properties they feel comfortable using.

10. **To solve an equation means . . .**

    Students should indicate that solving an equation is finding a value for the variable that makes the equation true.

11. **O/Δ = Δ/O**

Find at least four values for O and Δ that make this a true sentence. What do you notice?

Any numbers students use except 0 will be appropriate. Watch for substituting 0 for both symbols. 0/0 is undefined. Or substituting 0 for either symbol in the denominator will not work as it will create another undefined expression.

12. **Solving an equation is like (unlike) solving an inequality because . . .**

Answers will vary. Some students may indicate a similarity in solution patterns or procedures. Others may focus on the number of solutions.

13. **Jennifer found an answer sheet for algebra problems. One problem's solution was:**

What problem might have this as a solution? Is your answer unique? Why or why not?

Answers are not unique. Most students will note that equivalent inequalities can be written. For example, $x < 4$, $2x - 8 < 0$.

14. **A linear equation is . . .**

Students' comments may show different perspectives. For example, some students may focus on the graph of the equation, which would be a line, while others may look at the degree of the equation.

15. (Note to teacher: draw a line *l* on a Cartesian coordinate system for students to refer to in this problem.)

Write five things you know about line *l*. The most important thing about the line is_____ because . . .

Students' responses will depend on the line that you have drawn. You can vary the prompt by drawing a different line for two or more consecutive days.

16. Graphing on a number line is the same as (or different from) graphing on a Cartesian coordinate system because . . .

Answers will vary. Watch for mention of the one-dimensionality of a number line and the two dimensions of a coordinate system.

17. Karla gave Jaimie this expression to write in words. What do you think Jaimie wrote? Create another expression in words that is similar to the one that Karla gave Jaimie.

$$\frac{7(x+2)}{14}$$

Students should respond with something similar to "the product of 7 and the sum of x and 2 divided by 14." Encourage students to use words other than "times" and "adding."

18. Kenisha said, "A coefficient and a constant are the same thing." Mitchell disagreed, "Not true. There are some similarities, but the words mean different things." Who do you agree with and why?

Students should agree with Mitchell. They may note that one similarity is that a constant is a real number. A coefficient is also a real number. However, when used in an algebraic expression, they are different.

III. Measurement

1. **Tanya asked Je'Lisa to measure a table's height in centimeters. What tool do you think Je'Lisa will use to do the measurement? Why?**

   Students should indicate that she will select a centimeter stick or a meter stick.

2. **What is surface area? Describe and show examples.**

   Students should respond with more than a formula. They should not focus on prisms, specifically cubes. They should respond more generally, relating the measurement to the sum of the areas of the faces. Some students may describe the area that is made by tracing around each of the faces of the shape.

3. **What is volume? Describe and show examples.**

   Students should respond with more than a formula. They should not focus on prisms, specifically cubes. They should respond more generally, relating the measurement to the number of cubes that can fill an object.

4. **Write a letter to a sixth-grader describing the difference between perimeter and area.**

   Students should note the one-dimensionality of perimeter in some way as compared to the two dimensions of area. They may discuss the distance around a shape for perimeter and the amount of space contained within the boundaries of a shape for area. Watch for responses incorrectly referring to three-dimensional shapes.

5. **The circumference of a circle and the perimeter of a hexagon are alike (or different) because . . .**

   Students' responses usually indicate that both measure around the shape.

6. **"If you convert feet to yards, you divide the number of feet by 3," said Katye. Buffi argued, "No, you multiply the number of feet by 3." Who do you agree with? Support your answer.**

   Students should agree with Katye and give a credible rationale with an example or other support.

7. **Find as many rectangles as you can that have an area of 36 square units. Draw them, showing their dimensions. What do you notice?**

   Most students will show whole number dimensions. They may note that the dimensions are factors of 36.

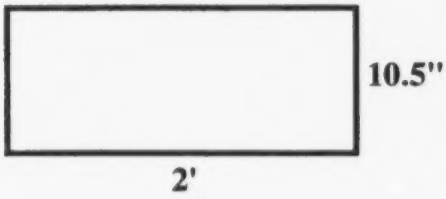
8. **I. M. Sure said, "Whenever a rectangular prism's surface area increases, its volume also increases." I. Know said, "That's true. I can prove it." Do you think this can be proven? If so, prove it. If not, tell why.**

   Students should give examples to show that it is not true. For example, a prism with dimensions of $6 \times 4 \times 4$ has a surface area of 128 square units and a volume of 96 cubic units. Compare a prism with dimensions $5 \times 5 \times 5$. Its surface area is 150 square units and its volume is 125 cubic units. Surface area increased but volume decreased.

9. **Nielsen wrote an essay about pi. In his paper, he stated that pi is $\frac{22}{7}$ or 3.14. Do you agree with him? Why or why not?**

Pi is neither $\frac{22}{7}$ nor 3.14. These are only approximations. It will be interesting to note if students convert $\frac{22}{7}$ to decimals and then make comparisons to 3.14.

10. **Trisha was trying to find the area of a rectangle shown below. Do you agree with her work? Explain.**



2 × 10.5 = 21 square inches

Students should disagree because area cannot be found by using two different measurements for the dimensions.

IV. Geometry

1. **The geometric tool (ruler, compass, protractor, computer software) that I use the most is _____ because . . .**

   Students' responses should give the name of the tool and a rationale as to why they use that tool most often.

2. **"A parallelogram and a rectangle are the same thing," said Scott. Tabatha looked surprised and said, "No, they're not. They have nothing in common." What could you add to their argument?**

Students should notice that a rectangle is a parallelogram but a parallelogram is not always a rectangle. Their common characteristics include (1) opposite sides are parallel, (2) opposite angles are congruent, (3) opposite sides are congruent, (4) each has two diagonals, (5) diagonals are congruent, and so on. Students may add other features, depending on the level of your class discussion. Some students may focus on how they are different. For example, a rectangle has four right angles, but a parallelogram may not.

3. **Can a right triangle be equilateral? Justify your response.**

   Students should indicate that it is impossible. They should justify their claim with drawings or a logical explanation. The explanation may include the fact that equilateral triangles have equiangles, each measuring 60°.

4. **Cassie thought that a rhombus and a square are the same thing. Is she right? Prove it.**

   Students may comment on like qualities such as congruent sides. However, a rhombus may not have 90° angles.

5. **Ben's teacher asked him to draw two figures that were congruent *and* similar. What do you think Ben drew? Why?**

   All congruent shapes are also similar. It would not matter what Ben drew as long as they were congruent. Then the figures would meet both conditions.

6. **Draw a two-dimensional shape and a three-dimensional shape. Write three ways they are the same and three ways they are different**

   Answers will vary depending on the shapes students choose. To compare the shapes, students may discuss the faces of the three-dimensional shape.

7. **Draw a shape that will tessellate. Describe how you created the shape so that it would tessellate.**

   Students may use a hexagon, a square, or a triangle. Others are also possible. Watch for shapes that will not tessellate, such as a circle.

8. **I think the volume of a cylinder is more than (or less than) the volume of a cone when the bases are congruent and heights are equal because . . .**

   Depending on the developmental level of the concept of volume, students may notice that cones are $\frac{1}{3}$ the volume of a cylinder with the condition of congruent bases and equal heights.

9. **A circle and a sphere are alike (or different) because . . .**

   Some students may comment that a circle may be formed when a sphere is cut. Others may mention that one has two dimensions and the other has three dimensions.

10. ***Isosceles* is often used to describe trapezoids and triangles. What does it mean? What are shapes' features when they are said to be isosceles?**

    Students may sketch examples or discuss the congruency of two sides of the trapezoid. Isosceles triangles have at least two sides congruent.

11. **Aurora said, "I see geometry everywhere when I'm outside of school." Describe what Aurora sees and show how it relates to geometry.**

    Students' responses should describe geometric phenomena they find in the environment. Look for specificity in their responses.

12. Leilani cut apart a hexagonal pyramid. She cut only on the edges. What shapes would she have? Justify your answer with a drawing or a written explanation.

Students should indicate that she would have a hexagon and six triangles.

13. Jennifer was taking a geometry test. One of her questions was "True or False: All circles are congruent." How should she answer? Justify your answer.

All circles are similar but not congruent. They are congruent only if the radius or diameter is equal in length.

14. Draw any pentagon. Write a problem involving the pentagon. Be sure to label any parts of the pentagon necessary to solve the problem.

This prompt is one that can be used in class the next day as a warm-up problem. Have students trade with other groups or individuals to solve.

15. I think the term *bisector* means . . .

Encourage students to use their own ideas and drawings to respond rather than a formal book definition. There are different contexts that students can use in their responses. For example, they may discuss an angle bisector or a line bisector. In class, you can have students share their responses. They should identify commonalties across responses, such as the idea that bisectors "divide" things into two congruent parts.

V. Statistics and Probability

1. **Probability is . . .**

   Students' responses should describe what they think probability is. The depth of their responses may be related to their prior experiences with probability.

2. ***Statistics* means . . .**

   Students' responses should describe what they think statistics *means. The depth of their responses may be related to their prior experiences with statistics.*

3. **Measures of central tendency communicate ideas about a data set related to "middleness." Select one measure of central tendency and describe how it is a measure of "middleness."**

   Students should select from mean, median, or mode. Their descriptions should focus on the relationship of that term to an averaging of some sort.

4. **If I know the median, I know that . . .**

   Students will comment on what a median signifies to them. They may indicate that they know that 50% of the data points in the data set are above the median and 50% are below.

5. **I would use a line graph to show . . .**

   Students should discuss the types of data appropriate for a line graph. This would include continuous data.

6. **It is important to select the appropriate measure of central tendency. Choose one of the measures and describe the best use of it.**

   The mode should be used whenever it is important to know the most frequent number or item. The mean should be used whenever the data set is relatively homogeneous. The median should be used whenever there are outliers.

7. **A graph is a good way to display data. It is, however, also possible to mislead someone by altering your graph. How could that be possible?**

   Graphs can be altered by changing the intervals on either axis. Data can also be skewed by the type of graph that is selected. Students may indicate other possibilities.

8. **List five things that are important to consider when you collect data. Select one of them and describe why it is important.**

   Students' responses may focus on a wide variety of ideas about what is important. These may include having a clear question, sampling techniques, data analysis, graphical or other representations, and implications of the findings.

Affective/Attitudinal Prompts: Grades 7–8

1. **When I am in my math class, I feel _____ because . . .**

2. **Write a letter to your best friend describing what happens in our math class.**

3. **Draw a picture of a mathematician on a typical workday. Describe the work a mathematician does.**

4. **What does a mathematician do for fun?**

5. **I think a math student is (or is not) a mathematician because . . .**

6. **I will probably (or probably not) take more math classes in high school because . . .**

7. **Pick a song that shows how you feel about math. Describe why it shows your feelings.**

8. **If I could change one thing about our math class, it would be to . . .**

9. **A job that uses a lot of math is _____ because . . .**

10. **Real-life math means . . .**

11. Using group work in math makes me feel . . .

12. Mathematics is . . . How does it compare to arithmetic?

13. Problem solving is . . .

14. Geometry is . . .

15. When I study probability, I think I will learn . . .

16. My favorite thing in math this year was when . . .

17. My math class last year was the same as (or different from) this year's class because . . .

18. My parents (or guardians) did (or did not) like math because . . .

19. To be a better math student, I need to . . .

20. If I had to solve 25,768 ÷ 37, 1 would (or would not) use a calculator because . . .

21. Computers are (or are not) useful in math because . . .

22. How could you show that math and science are related?

23. The one tool that is used most to do math is the _____ because . . .

24. Draw a picture of a "perfect" math student. Describe why your student is perfect.

25. If I could change one thing about myself as a math student, it would be . . .

26. Studying mathematics is (or is not) important because . . .

27. My feelings about mathematics have changed (or have not changed) since elementary grades because . . .

28. The perfect mathematics textbook would have . . .

29. A mathematician and a scientist are alike (or different) because . . .

30. New mathematics are (or are not) discovered each day because . . .

Process Prompts: Grades 7–8

1. **Draw a picture of how you do your homework. Describe what you are doing.**

   Students' responses should include a picture and a description of what they are doing.

2. **To study for a math test, I . . .**

   Students should describe the processes they use when they study for a test. Some students may indicate they do not study for a test. This may be particularly true if you are using a program such as Algebra I: A Process Approach, *Second Edition. In that program, students are reviewing continually and they may feel ready to take tests without additional study time.*

3. **Mark made a diagram that shows the process he uses to solve a word problem.**

   Read problem=> Try to figure out what it means=> Read it again=> Try a plan=> Solve it

   Make a diagram like Mark's to show how you solve a word problem.

   Students may draw a circular cycle rather than a linear one like Mark's. The purpose of this prompt is to help students understand the process they use in solving a problem. If you notice that students consistently show a process that is repetitive in steps (for example, re-reading the problem), then you may want your class as a whole to discuss that. This will help students understand that problem solving often requires the solver to re-read a problem or to re-create a plan.

4. **When I see a word problem, I first _____. Then I . . .**

   Responses should give you an indication of students' attitude or feelings toward problem solving. Some students may comment on the process they use while others may discuss how they feel about problem solving.

5. **Explain to a fifth-grader how to estimate using percents.**

   Students' responses should describe an appropriate method for estimating with percents. Some students may describe a method that uses benchmarks or methods similar to those used with fractions or decimals. You may find some methods that you would like students to share with the class.

6. **The problem-solving strategy I use the most is _____ because . . .**

   You will notice that students often describe methods that you have seen them use in homework assignments. You may want to ask students to describe a problem that fits well with their problem-solving strategy. It would be interesting to compare those problems across the class as some students will suggest different strategies, but give the same problem.

7. **Describe how you decide whether to use paper and pencil, a calculator, a computer, or mental math to solve a problem. Give examples of problems to support your description.**

   Students should clearly describe how they make the decision for the method to solve a problem. You might ask students to share their processes for making those decisions.

8. **Describe how you remember the order of operations. Be specific in your description.**

   Many students will describe a mnemonic such as Please Excuse My Dear Aunt Sally (PEMDAS). You may have students share their memorization techniques with the class.

9. **When I estimate distances or lengths, I . . .**

   Students should describe the process they use for estimating length. Encourage students to give the referent they use for various length measurements. For example, how can they estimate how long a foot is? A meter?

10. **I would understand geometry ideas better if . . .**

    Students' responses may give you an indication of ways you can help support their understanding geometric topics.

11. **Learning mathematics is easier when I . . .**

    Students' responses should give you an indication of what they think would make learning mathematics easier.

12. **Draw a picture of what you look like when you are in math class. Describe what you are doing.**

    To completely respond to the prompt, students should include a picture and a description. This is an affective prompt, focusing on students' perceptions of the mathematics class.

13. **Learning math is the same as (or different from) learning how to read because . . .**

    Students' responses may show connections between mathematics and reading. They may indicate some strategies common to both disciplines.

14. The most important thing to learn in math is . . .

The responses should give you an indication of what students value. They may give specific topics, concepts, or skills, or they may focus on specific strategies. Some students respond in general about the type of thinking they use in mathematics.

15. To help me better understand how to do operations with fractions or decimals, I would change my math book so that . . .

Students' responses may give you an indication of what they feel they need in order to understand rational numbers. You may find some of their responses helpful in determining the instructional strategies to use.

16. When I need to round a number, I . . .

Students should indicate an appropriate mathematical process for rounding a number. Some students may give benchmarks while others describe specific rules or procedures about rounding. It will be interesting to note if students differentiate between rounding and estimating.

17. The estimation strategy I use most is _____ because . . .

Students should give an estimation strategy such as front-end, compatible numbers, or clustering along with an appropriate reason for why they use that strategy.

18. I can justify or check my answer to a division problem by . . . Explain why this method works for checking division.

Multiplication is a common method students use to justify or check their quotients. If they use multiplication, they may indicate that multiplication and division are inverse operations. Other methods could include repeated subtraction or checking with a calculator.

19. When I see a problem I don't know how to work, I . . .

Students' responses can help other students understand how they can attack a problem when a solution is not evident. Sharing responses with the whole class may give others some methods for working with unfamiliar problems.

20. Fractions and decimals are related because . . .

Students should give mathematically appropriate relations between fractions and decimals. You can change the prompt by using any rational number subset or other number systems.

21. Tiana said, "I worked a problem but I can't tell if my answer is reasonable." What would you tell Tiana to do if her problem involved multiplication?

Students should give a mathematically appropriate way for determining reasonableness of products. This can include the number of digits in the product. You can change the prompt by substituting division, addition, or subtraction for multiplication.

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